Before the
Federal Communications Commission
Washington, D. C. 20554

In the Matter of	)	
	)	
Carrier Current Systems, including Broadband over Power Line Systems	)	
	)	
	)	
Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems	)	ET Docket No 04-37

Comments of Jan A. Tarsala

Introduction

1. The orderly deployment of Access Broadband over Power Line (Access BPL) systems and the protection of licensed Government and non-Government radio services from harmful interference require three additional technical requirements omitted in the Notice of Proposed Rulemaking, ET Docket Number 04-37 (the *Docket*):

    - incentives to operate Access BPL systems on frequencies which are not likely to support skywave propagation;

    - incorporation of *failsafe* control systems into Access BPL injectors, extractors, and repeaters; and

- regulations to require isolation networks to prevent the transmission of Access BPL signals over sections of the medium voltage electrical power distribution system which are not currently serving subscribers of the Broadband over Power Line service.

2. I make these *Comments* as a practicing microwave engineer at a Federally-Funded Research and Development Center with a Master of Science in Electrical Engineering degree, as a holder of a General Radiotelephone Operator's License and former broadcasting Chief Engineer, and as an Extra Class Amateur Radio licensee. My 29 years of professional experience, graduate-level college engineering education, and 37 years in amateur radio provide me with the analytical and practical background to provide *Comments* to this Notice of Proposed Rulemaking.

Additional Technical Requirements

Incentives to operate Access BPL systems on frequencies which are not likely to support skywave propagation

3. As I have already stated in my Comments filed in response to *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket Number 03-104, the use of portions of the medium frequency (MF, 300 kHz to 3 MHz) and high frequency (HF, 3 MHz to 30 MHz) radio spectrum by Access BPL systems carries substantial interference risks due to the propagation of these regions of the electromagnetic spectrum via ionospheric skywave. Unwanted emissions from Access BPL systems can affect licensed radio services at great distances and across international boundaries; identifying, locating, and mitigating these unwanted emissions are enormously complicated by the skywave propagation. Because licensed radio services in other countries can be affected, these instances of harmful interference will become matters for the U.S. State Department. Moreover, the Commission has proposed regulations for Access BPL systems which place the burden of proof in cases of harmful interference upon the victim, and the victim may not have the resources necessary to successfully petition the offending Access BPL system operator to effect mitigation of the harmful interference, and much less so the timely, prompt correction of harmful interference that has propagated via skywave. My engineering judgment is that the Phase 2 study of the National Telecommunications and Information Agency described in Appendix F of their

report *Potential Interference from Broadband over Power Line (BPL) to Federal Government Radiocommunications at 1.7 - 80 MHz*, NTIA Report 04-413, will conclusively show that harmful interference to licensed radio services from Access BPL systems can propagate via skywave over substantial distances, including across international boundaries.

4. The Commission should, in crafting its regulations for Access BPL systems, encourage, therefore, the development and deployment of Access BPL systems that use radio frequency spectrum unlikely to propagate via skywave. Situations of harmful interference are then constrained to be local matters (except in cases of harmful interference to the various *satellite services*), and victims will have far greater probability of identifying, locating, and successfully petitioning the Access BPL service provider to effect mitigation of the harmful interference. Indeed, direction-finding techniques and equipment are far more efficacious in the low-very high frequency (low-VHF, 30 MHz - 50 MHz) and very high frequency (VHF, 30 MHz -300 MHz) spectrum, where propagation is predominantly by a direct wave, as compared to direction-finding techniques and equipment necessary in situations involving MF and HF spectrum. Operation of Access BPL systems within MF and HF spectrum (as is currently occurring at some Access BPL trial locations) should be discouraged because of this skywave propagation hazard. Note well that the incessant trend over the entire history of electronic and communication systems has been the use of ever higher data-clock and radio-carrier frequencies. There is no reason to presume that this trend will be halted. Just as the ability to transmit broadband data over as arduous a

communication channel as a medium voltage electrical distribution power line once seemed impracticable, so, too, the technical barriers to Access BPL systems using low-VHF and VHF spectrum in deference to MF and HF spectrum will surely fall. The Commission should facilitate this transition to low-VHF and VHF spectrum by Access BPL systems by adopting unwanted emission limits which are more stringent at MF and HF than have been proposed in the Notice of Proposed Rulemaking, and which are *comparatively* more lenient within low-VHF and VHF spectrum. The definition of the specific levels to be applied over MF and HF spectrum must, however, await the results of the Regional Deployment Model to be analyzed during Phase 2 of the NTIA study (detailed in Section F.4 of *Potential Interference from Broadband over Power Line (BPL) to Federal Government Radiocommunications at 1.7 - 80 MHz*).

Incorporation of *failsafe* control systems into Access BPL injectors, extractors, and repeaters

5. The Commission has correctly placed strong emphasis on the requirement for Access BPL service providers to mitigate harmful interference to licensed radio services. It is noteworthy that the proposed regulations for Access BPL systems do not define what constitutes *prompt* or *timely* response to instances of harmful interference and, for this reason, the proposed regulations are deficient. Nonetheless, implicit in the proposed regulations from the Commission is the concept of *assured control* of Access BPL terminal units and repeaters by the Access BPL service provider so that mitigation of

harmful interference to licensed radio services can be effected. *Assured control* is also known within the engineering profession as *positive control* and as *failsafe operation*. There are several key elements necessary for a system to exhibit *assured control*:

- *Timeout timers* and *anti-babble circuitry*. These prevent a transmitter, whether wireline or wireless, from locking into continuous transmit, thereby monopolizing a channel. Timeout timers and anti-babble circuitry are implemented as independent, dedicated, hardwired circuits so as to specifically guard against runaway software. As an example, timeout timers are commonplace in land mobile radio systems.
- *Heartbeat messages* and *heartbeat timers*. Heartbeat messages are periodically exchanged with supervisory elements of a system. If the heartbeat message is not exchanged, the heartbeat timer expires and the subordinate element is rendered inert. A heartbeat ensures the control channel from supervisor to subordinate is functional and, in software-driven systems, the periodic resetting of the heartbeat timer upon receipt of the heartbeat message ensures that the software has not locked up or run away. The heartbeat interval is dictated by the permissible system response time to the fault, and for Access BPL systems, good engineering practice would suggest a heartbeat interval in the range of one second to one minute. An example of a heartbeat system is found in the broadcast service, where loss of the studio to transmitter control link forces a shutdown of the broadcast transmitter.

- *Failure modes analysis* and *fault tree analysis*. Both of these analytical methodologies examine the hardware, the software, and the system to identify and to correct deficiencies that could result in a loss of *assured control*. These analyses may be performed by the design and development engineers directly responsible for the implementation, but the results are always submitted for an independent, detailed peer review, often by a registered Professional Engineer.

6. The Commission should require all of the above as part of its Verification procedure for Access BPL system, injector, extractor, and repeater equipment authorization in order to promote *assured control* of the Access BPL system by the service provider. As an example of why this is necessary, let me explain the situation that exists where I live in Arcadia, California. Here, MetroCell Communications obtained a franchise from the city to install a wireless Internet access system. The network was composed of dual-band (915 MHz and 2.4 GHz) wireless nodes deployed on an approximately 1 km grid throughout the city. The architecture was a cooperative wireless mesh network without any wireline infrastructure. The wireless nodes are suspended upside-down from the support arms for streetlights and are powered by the street lighting circuit. The wireless node antennas are monopoles that use the compact weatherproof housing of the node electronics as a ground plane. The business venture was a failure and MetroCell Communications went bankrupt. However, the wireless node equipment remains in place and powered! The bankrupt company could not pay anyone to retrieve its hardware, and conversely, it is less costly for the local power utility (who operates the street lighting system) to continue to supply

power to the wireless nodes than it would be to send out crews to disconnect the parasitic load. So throughout my city, these derelict transmitters continue to spew radio pollution, useless to anyone. Slowly, one by one, because the wireless nodes were fortuitously mounted upside-down on the streetlight arms, their monopole antennas are falling out, squelching their emissions. If the attributes necessary for *assured control* outlined above had been followed for the MetroCell Communications hardware and system, the interference predicament present in the city of Arcadia would never have taken place. Now just as MetroCell Communications never contemplated failure in the marketplace, so, too, Access BPL service providers never plan for bankruptcy. The Commission must make the elements necessary for *assured control* a fundamental part of the Verification process for Access BPL system, injector, extractor, and repeater equipment authorization. Without *assured control*, licensed radio services who are victims of harmful interference from Access BPL systems may find there is truly no way -- or no one -- to effect mitigation.

Regulations to require isolation networks

7. Good engineering practice dictates that isolation networks be used to prevent the transmission of Access BPL signals over sections of the medium voltage electrical power distribution system which are not currently serving subscribers of the Broadband over Power Line service. For example, a branch line of several hundred meters or of several kilometers might be present in a rural environment leading out to an irrigation pump. It

makes no sense to allow Access BPL signals to propagate over this line -- and to radiate, potentially at the proposed Part 15 emission levels -- when there is **no one** to be serviced by these signals. The Commission should include regulations that require Access BPL systems to constrain their signals to those lines that are servicing active subscribers. Line activation should be driven by subscriber contracts, not upon speculation of a potential customer base. This good engineering practice is the wireline analog to the use of the minimum power necessary to achieve communications by a wireless system. Indeed, wireline Access BPL systems must adhere to the *dual requirement* of minimum transmission power *and* minimum energized right-of-way, and, as a result, the emissions documented by the NTIA in *Potential Interference from Broadband over Power Line (BPL) to Federal Government Radiocommunications at 1.7 - 80 MHz* will be minimized.

Summary

8. In the *Docket*, the Commission has correctly and plainly reiterated that licensed radio services must be protected from harmful interference from unlicensed services such as Access BPL. The technical requirements identified herein will minimize the potential for harmful interference to licensed services originating from Access BPL systems.

I thank the Commission for its attention to these my *Comments*.

Respectfully submitted this Third Day of May, 2004, by

___/s/___Jan A. Tarsala_____

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